

2019 Progress Report

Watershed Approach to Toxics Assessment and Restoration (WATAR) Program

Delaware Department of Natural Resources and Environmental Control (DNREC)

April 1, 2020

WATAR TEAM:

**John Cargill, Tyler Monteith, Andy Howard
Watershed Assessment and Management Section (WAMS)**

**Todd Keyser, Randy Wolfe, Vanessa Hamm, Patrick Boettcher, Dannielle Pratt
Remediation Section (RS)**

**Ellen Dickey, Dave McQuaide
Environmental Laboratory Section (ELS)**

**Mike Stangl, Johnny Moore, Edna Stetzar, Jordan Zimmerman
Fisheries Section (FS)**

Introduction: The Watershed Approach to Toxics Assessment and Restoration (WATAR) was conceived by DNREC in 2012 with the intention of building a bridge between the surface water toxics program and the site investigation and restoration program in Delaware. The focus of the WATAR program is surface waters, sediments, fish and other aquatic life impacted by toxics, the health of fish and shellfish consumers, and the link to the sources/sites responsible for those impacts. The concept was officially endorsed by DNREC leadership in the fall of 2012 following a series of briefings and the completion of a 5-year work plan. Data and information collected in conjunction with this plan are intended to be used to document progress toward implementing Total Maximum Daily Loads (TMDLs) for PCBs and other toxic compounds in the Delaware Estuary and its tributaries. The data and information collected will also be used to identify other contaminants that may need TMDLs or other clean up actions in order to restore water quality.

The second WATAR 5-year work plan (2018-2022) identifies fourteen (14) specific activities for 2019. Those 14 activities are listed below with a status report on each. In addition to the 14 items, there were numerous additional activities that have been ongoing, and for which updates are provided. Last, there were a few new items which arose during 2019 in which the WATAR team became involved. All of these items and activities are presented in this progress report.

As was noted in the WATAR 2018 Progress Report, Dr. Richard Greene retired from the State of Delaware's DNREC (in April 2018). Dr. Greene managed many aspects of the WATAR program, and

his depth of knowledge about Delaware's surface waters and Delaware's fish advisory program will be missed. To date, Dr. Greene's position within the Watershed Assessment and Management Section of DNREC has still not been filled. Until such time that the position is filled, and the incumbent is "brought up to speed" on WATAR related issues and projects, there may be a slight lag in completion of some planned activities. This is not to say that the items won't be addressed; only that some lower priority items will be pushed further down the 5-year schedule of planned activities. WATAR Progress Reports, including this report, will serve to document items that have been put on hold, or cancelled altogether, with accompanying rationale and schedule adjustment.

In addition, in 2019, the DNREC Division of Waste & Hazardous Substances went through a reorganization designed to focus on services provided by the Division. This reorganization has provided for many more mentoring opportunities in the Remediation Section to facilitate technology transfer, consistent policies related to persistent bioaccumulative and toxic compounds in the Remediation Section and the Strategic Services Branch and provided the WATAR team with more opportunities to create collaborative projects. As staff adjust to this reorganized construct, there have been delays in implementing some sampling and policy initiatives that we underway.

1. Continue data compilation and summary for 2013 – 2017 WATAR sampling

Status: On Hold

Discussion: Due to the retirement of key personnel in early 2018, reorganization of the Site Investigation and Restoration Section into the Remediation Section in 2019 and redistribution of tasks outlined in the WATAR workplan, this action item has not been a priority. However, when time and personnel allow, this action will result in the summarization of sampling and analysis performed by the WATAR program since 2012. It is anticipated that results will be presented by watershed, analyte and media. The results from the 2013 – 2016 period (sediment, water and fish) will also be compared to readily available data collected prior to 2013 and to follow-up data generated through completion of the second 5-year WATAR Workplan (2018-2022). Fish consumption advisories serve as the ultimate indicator of legacy toxic impacts, allowing trends to be assessed. Ongoing areas of concern (AOCs) will be noted along with known or suspected sources (both point sources and non-point sources). Please note that extensive data evaluation has occurred during each of the previous years, and actions were taken, as necessary, to address pressing issues. Results from sampling conducted in 2017 and 2018 in Delaware's Chesapeake Basin drainages are currently being summarized in a separate report to be submitted to USEPA's Chesapeake Bay Program.

2. Finalize SOPs for WATAR Sampling (sediment, surface water, fish) and begin drafting HSCA Sediment Assessment and Remediation Guidance

Status: On Hold

Discussion: Current SOPs are relevant and adequate for the sampling that was conducted in 2019. The WATAR Team will move this action item to a later date, and as time and personnel allow. In addition to updating SOPs, however, the WATAR Team began the process of adding PFAS sampling to the existing SOPs for future sampling efforts. This will be finalized in 2020.

An overarching framework/technical guidance document for assessing contaminated sediments has not been completed. However, an initial outline of the document was completed in 2015/2016. Furthermore, the WATAR team has documented several of its sediment quality screening assessment procedures and data evaluation methods based on previous site-specific assessments. That documentation will become part of a guidance document that is well informed by WATAR's experience. Due to personnel changes, sectional reorganizations and competing priorities in 2019, work towards sediment guidance development has been put on hold; however, the WATAR team intends to increase attention to this task moving forward, and as personnel time and project schedules allow.

3. Compile toxics data summary report for samples collected from Delaware watersheds that flow toward the Chesapeake Bay

Status: Ongoing

Discussion: The DNREC-WATAR team developed a multi-year plan to assess and address toxics in the portion of Delaware that flows to the Chesapeake Bay. Preliminary planning was conducted in 2016, field reconnaissance was conducted in early-mid 2017, a compilation of existing toxics data was completed in June 2017, development of a QAPP was completed in July 2017, collection of year 1 samples was completed in November 2017, and collection of year 2 samples was completed in October 2018. A more detailed summary of the project was included in the WATAR 2018 Annual Report. At this time, DNREC is compiling all of the data collected and received from laboratory analyses. Once compiled, a data summary report will be submitted to USEPA Chesapeake Bay Program.

4. Receive and review the Amtrak West Yards Remedial Investigation Report

Status: Ongoing

Discussion: DNREC received the Remedial Investigation Report in May 2019. The report is currently under review by the Remediation Section project officer. It is anticipated that comments will be provided to Amtrak in early 2020.

The Amtrak West Yard site is located west of Wilmington in close proximity to Little Mill Creek and the Peterson Wildlife Area. Cleanup of this site is being overseen by DNREC-Remediation Section (RS) through its Voluntary Cleanup Program. Sampling of Little Mill Creek in anticipation of the Meco Drive ditch remediation and the Little Mill Creek flood risk mitigation project identified the Amtrak West Yards as a probable source of PCB loading to Little Mill Creek and the Christina River. Following the completion of the Meco Drive pipe replacement project, sampling will occur in Summer 2020 to verify the effectiveness of the collective remediation and construction projects.

5. Build partnerships and seek funding for additional Christina River cleanup objectives/goals

Status: Ongoing

Discussion: Beginning in 2017, DNREC's WATAR Team coordinated with the Christina Conservancy to scope a high-resolution bathymetric survey of the lower Christina River and lower Brandywine Creek, where previous sampling of sediment, water and fish tissue has shown the most impact from chemical contaminants. The survey was completed in 2018 and will serve as a baseline for all other programs and partners to overlay data and restoration plans.

Following completion of the bathymetric survey in 2018, DNREC's WATAR Team co-sponsored a kickoff symposium for the long-term initiative to clean up the Lower Christina River and Lower Brandywine Creek in September 2019. The initiative, dubbed CBR4 (Christina/Brandywine River Remediation, Restoration and Resilience Project), aims to leverage public and private dollars in a concerted effort to reduce chemical and nutrient loading to the rivers, along with preparations for sea level rise in this commercially and recreationally used portion of New Castle County and the City of Wilmington. DNREC's WATAR Team is leading the effort for the remedial portion of the project by planning a feasibility study of remedial technologies to understand the costs and timing requirements needed for success. Delaware's Christina Conservancy is coordinating restoration and resilience planning by taking the lead in preparing federal agency grant applications. The team has already applied for a National Fish and Wildlife Foundation grant and is currently preparing an application for a National Oceanic and Atmospheric Administration (NOAA) grant.

6. Begin evaluation of Delaware specific bioaccumulation factors (BAFs) and biota sediment accumulation factors (BSAFs)

Status: Ongoing

Discussion: In 2016, the WATAR Team reported that Delaware specific BAFs may be much lower than some of the BAFs used by USEPA to derive national recommended human health water quality criteria (specifically for B[a]P). This evaluation was based upon Delaware's unique set of WATAR data. Based on the strength of the analysis, EPA has agreed to consider a Delaware proposal to adopt Delaware-specific human health criteria using Delaware-specific BAFs. The DNREC is in the early stages of working with fish tissue, sediment and water quality data from the WATAR program (collected between 2012 and 2017) to calculate Delaware specific BAFs and BSAFs. The data is intended to be used in a triennial review of water quality data. Data evaluation is ongoing, and calculations are expected to be completed in the first quarter of 2020.

7. Begin data collection efforts for possible dioxin/furan TEQ TMDL in upper St. Jones River and Silver Lake

Status: Ongoing

Discussion: The first step in the data collection process related to TMDL development was to collect fish tissue samples from the upper St. Jones River and Silver Lake to determine whether dioxin/furan trends in fish are decreasing. Fish tissue sampling occurred in October/November 2019. Based upon the results of the analyses, which have not yet been received from the DNREC subcontract laboratory, next steps will be developed.

8. Collect consumption advisory follow-up fish tissue samples from the following watersheds: Saint Jones (including Mirror Lake), C&D Canal, and Red Lion Creek

Status: Complete

Discussion: Fish tissue collection occurred in the Saint Jones River watershed, C&D Canal, and Red Lion Creek in October/November 2019. Samples were processed by DNREC-Environmental Laboratory Section and were subsequently shipped to a subcontract laboratory for chemical analysis in January 2020. In total, 21 composited fish tissue samples were submitted for analysis of PCBs, dioxins/furans, alkylated PAHs, organochlorine pesticides, methylmercury, PFAS, and percent lipids. The distribution of composited fish tissue samples included seven (7) from the C&D Canal, three (3)

from the Red Lion Creek, and nine (9) from the Saint Jones River, one (1) from Moores Lake and one (1) from Wyoming Pond. Once data is received from the subcontract laboratory, data will be used to track contaminant trends, to inform Delaware's 303(d) list, and to assess/modify fish consumption advisories.

- 9. Collect "head of tide" surface water samples for the Saint Jones watershed and Red Lion Creek watershed to track progress towards Delaware River Basin Commission (DRBC) PCB TMDL (target 1 dry and 1 wet event). Also, collect TMDL model boundary condition surface water sample from the C&D Canal at the Delaware/Maryland border (target 1 dry and 1 wet event).**

Status: On Hold

Discussion: Initially this sampling would have been conducted alongside fish tissue collection in the Fall of 2019. However, prior to planning field exercises for the referenced sampling, the WATAR team contacted the Delaware River Basin Commission (DRBC) to discuss sampling protocols and data quality objectives. The DRBC recommended that Delaware hold off on the sampling until after the Stage II PCB TMDL went into effect. Further, the DRBC said that they, themselves, were conducting head of tide PCB sampling in different Delaware River watersheds on a rotating basis. As a result, DNREC and WATAR put this effort on hold until a later date and focused on other emerging issues instead.

- 10. C&D Canal Area(s) of Concern trackback sampling (focus on sediments)**

Status: On Hold

Discussion: As mentioned earlier, personnel retirements, vacant positions, and Division of Waste & Hazardous Substances reorganization were complicating factors in 2018 and 2019. These factors, along with competing priorities for WATAR Team time and expertise, resulted in the postponement of C&D Canal sediment source trackback studies in 2019. These activities will simply be postponed until a later date, and will be better informed by up-to-date fish tissue data.

- 11. Continue to provide technical assistance to the City of Wilmington and New Castle County Special Services on the City's PCB trackback and implementation, and coordinate with DRBC**

Status: Ongoing

Discussion: In an ongoing fashion, the WATAR team has worked with the City of Wilmington and New Castle County as well as the DRBC to better understand, isolate and control sources of PCBs in the City and County's sewer system, which flows to the City's 100 MGD regional wastewater treatment plant. Discharge from the plant, in turn, discharges to the Delaware River. Through source identification studies and subsequent remedial actions, the City of Wilmington has achieved an approximate 90% reduction of PCB loading from their wastewater treatment plant effluent over the 10-year period 2005 – 2015. The WATAR Team continues to offer technical assistance, as necessary, and reviews annual pollution minimization reports when submitted to DNREC and DRBC. Several localized trackback studies aimed at source site discovery were conducted in 2019. While these efforts did not lead to a regulatory mitigation action, it does highlight the challenges related to high resolution detections of contaminants in the environment that do not have a readily identifiable

source. Additional investigations by New Castle County and City of Wilmington will continue in cooperation with the DNREC WATAR Team to mitigate sources.

12. Provide technical assistance to New Castle County Special Services and Delaware Department of Transportation (DelDOT) on their MS4 PCB Pollutant Minimization Plan (PMP) traceback and implementation, and coordinate with the DRBC

Status: Ongoing

Discussion: The WATAR team has previously worked with New Castle County Special Services and the DelDOT in the design and implementation of a sampling plan for analysis of PCBs in regulated stormwater discharges. This work was purposefully designed to complement sampling of receiving waters performed by the WATAR team within watersheds known to be impaired by PCBs. Results of the sampling events are reported to DNREC and DRBC as required by their MS4 permits. In 2019, the WATAR team continued its efforts to improve source tracking of PCBs to the Delaware River by assisting DNREC's MS4 group with finalizing draft permit language that mimics that which is already being incorporated into NDPES permits that requires traceback studies and corrective actions to mitigate larger stormwater PCB loads in impacted waterways. A new Phase I permit draft is being finalized by DNREC, which will then be shared with USEPA for comment. The current schedule indicates a target of September 2020 for finalization of the new Phase I Permit.

13. Tech Transfer: DNREC Leadership & Staff, DNERR, USEPA, ASTWSMO, ITRC, DENIN, etc.

Status: Ongoing

Discussion: An original goal of the WATAR program was to communicate and partner with others within and outside of DNREC to raise awareness and identify synergies leading to accelerated improvement of water quality in Delaware. Due to its success, the WATAR team continues to accomplish that goal by making presentations at local, regional and national meetings; preparing videos highlighting various projects; and preparing annual reports describing work accomplished. The WATAR approach has been noticed and sought out by government agencies at all levels; non-governmental organizations (NGOs) such as the Partnership for the Delaware Estuary, the Delaware Nature Society, the William Penn Foundation, the Christina Conservancy, and the Center for the Inland Bays; academia and the private sector. Specific presentations given in 2019 are listed below. In addition, but more difficult to document, the WATAR team gathers on a regular basis to provide insight from lessons learned on projects amongst technical peers as well as newly hired staff within DNREC. These meetings are part of the technical and policy mentoring that the WATAR team has implemented through its overall plan.

14. Progress Report

Status: Completed

Discussion: This document represents the Progress Report for 2019.

Ongoing/Unfinished Work from Previous Years: Often-times since the initiation of the WATAR Program in 2102, priorities and specific project momentum has shifted for one reason or another. The

following section summarizes some of those projects that are important to the Program, but that were either ‘On Hold’ or ‘Ongoing’ and that have an update since the last WATAR Annual Report.

Continue data compilation

Status: Ongoing

Discussion: As of December 31, 2019, all WATAR data reported during calendar year 2018 was successfully entered into the EQuIS database. Further, data collected at other sites where the high-resolution WATAR sampling approach was followed have been imported into EQuIS as part of the overall data compilation effort. These data include independent sampling for PFAS in surface water that is used for source water in the City of Wilmington and ongoing PFAS sampling of the Red Clay Creek and tributaries.

Roll out pilot web-based mapping utility

Status: Ongoing

Discussion: The EQuIS Enterprise utility is configured to allow some basic data mapping, by location and concentration, to occur. DNREC is continually working to expand data import/export capabilities utilizing the software that is already owned by the Department. As work continues to progress with the EQuIS database, a re-evaluation and cost/benefit analysis will be completed for a comprehensive and user-friendly third-party web-based mapping utility. In the interim, DNREC is conducting a pilot of data sharing and mapping with the USDOC National Oceanographic and Atmospheric Administration (NOAA) through their Environmental Response Management Application (ERMA) platform. Currently, development of an output from DNREC’s EQuIS database to the ERMA platform is underway between NOAA, USEPA R2 and DNREC. WATAR does have extensive calculation and presentation capability through the EQuIS and its functionality with existing platforms.

Interface between WATAR Team and Delaware’s Toxics in Biota Committee (Fish Advisories)

Status: Ongoing

Discussion: The WATAR team, in accordance with its 5-year plans, collect fish tissue samples mainly from 303(d) toxics-listed Delaware watersheds. The Delaware Toxics in Biota Committee, led by a WATAR Team member, reviews these data and makes recommendations to the Secretary of DNREC and the Secretary of the Department of Health and Social Services (DHSS) when new or revised fish consumption advisories may be needed. Based on fish tissue data that the WATAR team collected in 2017 and 2018, and which were evaluated during 2019, fish consumption advisories for Delaware’s Chesapeake drainages were not necessary. Sampling of fish in Saint Jones River, C&D Canal, and Red Lion Creek were conducted in October/November 2019.

Fort DuPont post-remediation sampling

Status: Ongoing

Discussion: USEPA and DNREC–WATAR coordinated on an emergency removal action along the shore of the Delaware River at Fort DuPont in 2013/2014. The removal excavated a portion of a landfill that was eroding into the river, and pieces of lead, other waste, and contaminated sediments were exposed at the surface. DNREC elected to proactively place a permeable reactive barrier (i.e. a trench filled with apatite-based fish bones), or PRB, to sequester metals

dissolved in the shallow groundwater prior to discharging to the river. A series of monitoring wells were installed on either side of the PRB to monitor the results of the removal action and to determine if the apatite based PRB was an effective barrier to lead leaching into the Delaware River. The first round of groundwater monitoring was completed in late 2018. A second round of groundwater monitoring was conducted in 2019. Results from the body of monitoring data collected to date have been inconclusive. However, seasonal variations of groundwater geochemistry at the site have not been evaluated with respect to contaminant discharge. Additional data will be collected as time and funding allows in order to better understand site-specific conditions in relation to contaminant sequestration.

Little Mill Creek/Meco Ditch post-remediation sampling - Meco Pipe

Status: Ongoing

Discussion: The Little Mill Creek Flood Risk Mitigation Project was completed in the summer of 2015. This project, spearheaded by the US Army Corps of Engineers (USACE), the New Castle Conservation District (NCCD), DNREC, and New Castle County, commenced in 2014. The project involved excavation and removal of bank soils and creek sediments to increase hydraulic storage capacity and decrease flooding of nearby properties. Monitoring of the success of the project was planned for 2017, but the team did not complete the task due to inclement weather and extreme temperatures. Following this time frame of inclement weather and extreme temperatures, the team discovered an ongoing release of petroleum from one of the stormwater pipes that flows to Little Mill Creek. The corrugated steel pipe had failed between the storm grate and the discharge due to the pipe sitting in free-phase petroleum. Free phase petroleum is associated with the historic filling on several industrial park areas surrounding Little Mill Creek. DNREC-SIRS has initiated an investigation to determine approximate volumes of soil that would be excavated for disposal surrounding the pipe, with the goal of replacement and remediation to stop the flow of petroleum to Little Mill Creek. This work is scheduled to begin in early 2020 depending on site logistics, weather and the availability of funding. Following the successful completion of the pipe project, DNREC will initiate the first round of remediation completion monitoring, most likely in Summer 2020.

Red Clay Creek zinc TMDL/NVF Yorklyn post-remediation monitoring

Status: Ongoing

Discussion: During the summer/fall of 2017, DNREC-RS completed a comprehensive source removal action at the NVF-Yorklyn site that resulted in the removal and disposal of approximately 170 tons of zinc from the soil. This soil source served as an ongoing groundwater source, which for almost a decade was captured to remove dissolved zinc prior to reaching the Red Clay Creek. In December 2017, and as part of the post-remediation monitoring, the zinc groundwater treatment system was taken offline. The Red Clay Creek was monitored monthly through 2018 to evaluate the effectiveness of source removal on loading of dissolved zinc through groundwater discharge. Regular monitoring of zinc in Red Clay Creek was ongoing in 2019 through statewide network sampling. As such, and as time allows, DNREC will formally document the monitoring results and will take the necessary steps to delist zinc as a contaminant-of-concern in the Red Clay Creek in Delaware.

Red Clay Creek per- and polyfluorinated substances (PFAS) investigation**Status: Ongoing**

Discussion: The WATAR team completed several rounds of sampling for per- and poly-fluorinated substances (PFAS) in Red Clay Creek in New Castle County in 2019. Following multiple detections and models concerning potential source areas, the WATAR Team conducted surface water sampling in the lower Red Clay Creek below Kirkwood Highway (Route 2). DNREC has combined the data collected via UCMR3 and subsequent monitoring of surface water, the DNREC dry and wet weather traceback sampling, and DNREC-SHWMS site and creek sampling data to determine a series of properties that are the potential source of PFAS to the Red Clay Creek. The ambient signature of PFAS detected using EPA Method 537M created a challenge in determining the potential source areas. However, by employing the WATAR traceback methodologies, DNREC has focused their investigation and has sent several Request For Information letters to property owners. Data analysis is ongoing to help determine where any potential source areas may be along Red Clay Creek or its tributaries.

Finalize Cleanup Plan for the Amtrak Wilmington Former Fueling Facility (including sediments within the Eastern Drainage Ditch)**Status: Ongoing**

Discussion: In 2019, and with agreement by USEPA TSCA and DNREC-RS, the Former Fueling Facility project and the Maintenance Facility project (contiguous sites) will be brought to the same regulatory process point. The purpose of this decision is to allow for a global remedy of both portions of the site. This rationale will likely result in a comprehensive remedy that is implemented in a shorter timeframe. As such, comments were provided by USEPA TSCA regarding the risk assessment for the Former Fueling Facility site in late 2019. Upon successful incorporation of USEPA comments by Amtrak into the final version of the Focused Feasibility Study, a Proposed Plan of Remedial Action will be issued by the DNREC-RS for public comment.

Coordinate with the City of Wilmington on the A-Street Ditch and South Wilmington Wetlands Project remediation.**Status: Ongoing**

Discussion: The City of Wilmington began the construction phase of the remediation and restoration project in Summer 2019. Construction was ongoing at the end of 2019, and inoculated Sedimite™ application in the west side of the A-Street Ditch is scheduled for early 2020. It is anticipated that the remediation and restoration of the South Wilmington Wetland site will be completed in the Summer of 2020. This project, when combined with other remedial projects conducted in the area, will result in a major improvement of water quality (including PCBs) in this area of the Christina River. The DNREC-RS project oversight manager is also a WATAR Team member.

Coordinate with EPA on Saint Jones River Sediment Assessment and Potential Remediation (associated with former Dover Gas Light site)**Status: In USEPA Control**

Discussion: DNREC personnel met with USEPA's Environmental Response Team (ERT) and R3 personnel in May 2018 to discuss findings from their independent assessment of PAHs in sediments of the Saint Jones River in the area of interest. At that meeting, DNREC identified a potential

mathematical error in USEPA's evaluation, which was later confirmed, and which changed the overall evaluation results and potential steps forward. DNREC received a final report in 2019 which summarized the field activities and evaluated data collected at the site. The conclusion was that a layer of coal tar related to the Dover Gas Light site exists beneath the sediments in the Saint Jones River in proximity to the former Tar Ditch (Meetinghouse Branch). Concentrations in sediments are causing impacts to benthic aquatic life in the Saint Jones River, and the full downstream extent of the PAH contaminated layer was not determined. Because the Dover Gas Light site is on the National Priorities List and cleanup is under the control of the USEPA (all responsible parties settled years ago), it is up to them to determine next steps. DNREC's WATAR Team will stay connected with USEPA through the Remediation Section and the Project Officer for the Dover Gas Light site.

Coordinate with the DRBC and USEPA on Stage 2 PCB TMDL for Delaware Estuary

Status: Ongoing

Discussion: The last meeting related to the Stage 2 PCB TMDL for the Delaware Estuary was held at DRBC on August 1, 2018. At that time, presentations were given regarding NPDES program implementation of the TMDL. Further, States raised a concern at that meeting that there was no implementation strategies for MS4 or waste site loads within the draft document. As of December 2019, no other meetings related to the Stage 2 PCB TMDL have occurred with State Co-Regulators. DNREC will continue its coordination with DRBC and neighboring states to finalize the Stage 2 TMDL, as necessary.

Former Dupont Edgemoor Dredging Data Review

Status: Complete

Discussion: The former Dupont Edgemoor facility in northern New Castle County Delaware was operated as a titanium dioxide manufacturing facility from approximately 1930 until 2015. In 2016, Diamond State Port Corporation purchased the facility with plans to develop the site into a containerized cargo port. In order for ships to be able to approach from the main channel of the Delaware River and dock at the site, approximately 3.5 million cubic yards of sediment will need to be removed and a new docking structure constructed. DNREC's WATAR Team was engaged by the environmental consultant on the project to provide comments to their evaluation of sediments for dredging and storage in a confined disposal facility. The WATAR Team provided initial comments on the draft evaluation of chemical contaminants in sediment in September 2018, which led to another comprehensive round of sediment sampling and analysis. A second version of the report, which included a more comprehensive evaluation of site conditions and contaminant distributions, was submitted in draft in November 2019. Upon review, the WATAR Team will provide comments on the Environmental Assessment Report.

Dam Removal Sediment Evaluations

Status: Ongoing

Discussion: In late 2018, DNREC's WATAR Team was contacted by representatives from Delaware Senator Chris Coons' office and a representative from the University of Delaware to discuss the removal of dams in the Brandywine Creek and the potential impacts from contaminated sediments that reside behind them. Since that time, a group called Brandywine Shad 2020 has successfully obtained a National Fish and Wildlife Foundation (NFWF) grant to evaluate removal or modification of the dams to promote passage of anadromous fish species. The WATAR Team,

including a representative from DNREC F&W, was in communication with Brandywine Shad 2020 throughout 2019 as it developed plans for its Feasibility Study. Due to the importance of being prepared for any potential surface water quality impacts in areas upstream of drinking water intakes, the WATAR Team offered a rough sediment sampling work plan to determine the nature and extent of potential contaminants, to supply staff for the processing of samples in the field, to cover all analytical coordination and costs, and to develop a summary report of analytical results. The WATAR Team will remain engaged with this group as plans are carried forward, and will provide technical assistance for the characterization and disposition of impacted sediments prior to any dam removal activities, should it be necessary. It is anticipated that sediment sampling will begin early in 2020.

Other significant activities of the WATAR Team during 2019: The items below are summaries of projects/initiatives that were unplanned during preparation of the WATAR 5-Year Plan (2018-2022), but for which the WATAR team became involved.

Indian River Dredging Evaluation

Status: Ongoing

Discussion: In 2019, the WATAR Team was asked by DNREC's Wetland Assessment and Monitoring Section to help evaluate whether dredge material from the Indian River in Delaware could be used beneficially for wetland restoration without increasing risk to ecological receptors. In order to conduct the evaluation, sediment samples were collected and analyzed for toxic compounds. Next, an evaluation was done to determine if any compounds were present that might impact benthic aquatic life, if there were any projected detrimental effects from the dredging itself, and whether there might be any human health issues related to placement of dredge spoils in an upland location from drying. This evaluation was used to support the issuance of the dredging permit in early 2020. The next phase of the evaluation will be to determine if contaminant concentrations of the dredge material will have any potential impact on birds or other wildlife that will inhabit and feed within the proposed intertidal wetland. If not, then the next round of dredging, in 2021, will be utilized to construct/repair an intertidal wetland in Sussex County, Delaware.

PFAS Team and Steering Committee

Status: Initiated/Ongoing

Discussion: As part of a larger initiative to create a DNREC Team that will organize the DNREC's response to emerging contaminants, WATAR Team members are actively leading and participating in the PFAS (per and polyfluoroalkyl substances) Team. Two members of the WATAR Team are members of the PFAS Team Steering Committee. The larger effort brings together staff in the DNREC that are currently working on PFAS related policy, sampling, risk analysis communication and remediation topics. Many of the founding principles of the PFAS team follow the WATAR approach of using high-resolution sampling to proactively detect contaminants in the environment, track and share data while researching and promoting innovative solutions. PFAS sampling will be considered for all WATAR watersheds as prudent. The dynamic topics related to PFAS create challenges related to mitigation and management that require a team effort, as well as a logical stepwise decision-making framework. This approach is exemplified by the WATAR program.

A-Street Mouth/Christina River Pilot Study (Sedimite™ with inoculant)

Status: Ongoing

Discussion: As was reported in the 2018 WATAR Annual Report, funding for the innovative PCB destroying technology was awarded by DNREC-RS in June 2018. Per the DNREC approved workplan, baseline sampling of sediments using traditional techniques and more innovative passive sampling techniques (time integrated) was conducted in April/May 2019. Application of the inoculated Sedimite™ was conducted in June 2019. A USEPA Multipurpose Grant was awarded to the DNREC project team to conduct analysis and reporting of samples collected in November/December 2019 to evaluate whether PCB destruction is occurring. DNREC is expecting results of the interim sampling by the end of the first quarter 2020. A short video of the project can be found here <https://www.youtube.com/watch?v=3tcV6vmJJ8Y>.

WATAR Related Presentations: Members of the WATAR Team delivered the following presentations related to the WATAR program activities during 2019:

- Keyser, T.A., 2019 – Christina Brandywine Remediation – poster session at the Partnership for Delaware Estuary – Delaware Estuary Science and Environmental Summit, Jan 28-30, 2019
- Cargill IV, J.G. and Keyser, T.A., 2019. WATAR – Progress Towards a Common Goal. Presentation given at DNREC-RS Technical Meeting, March 5, 2019.
- Cargill IV, J.G., 2019. Revising Fish Consumption Advisories One Step At A Time. Presentation given at Chesapeake Bay Program STAC Meeting - Integrating Science and Developing Approaches to Inform Management for Contaminants of Concern in Agricultural and Urban Settings, May 21, 2019.
- Cargill IV, J.G., 2019. A Watershed Scale Strategy for Contaminant Management. Presentation given at Human & Climate Series III – Water Management and Policy: Local and Global Perspectives, June 7, 2019.
- Cargill IV, J.G., 2019. A Watershed Scale Strategy for Contaminant Management. Presentation given at Surface Water Assessment Section Technical Information Session, June 20, 2019.
- Keyser, T.A., 2019 WATAR – Progress Towards a Common Goal – presentation to the Source Water Protection Region 3 States, June 20, 2019
- Cargill IV, J.G., 2019. A Watershed Scale Strategy for Contaminant Management. Presentation given at Urban Waters Federal Partnership – Brownfield Community of Practice Meeting, August 7, 2019.
- Cargill IV, J.G., 2019. Christina/Brandywine River Remediation, Restoration & Resilience (CBR4) – Presentation given at Technical Workshop #1/Project Kickoff Symposium, September 10, 2019.
- Cargill IV, J.G., 2019. An Integrated Approach to Revitalizing a Brownfield Site – Achieving Multiple Benefits Through Collaboration – NVF-Yorklyn, Delaware. Presentation given at Maryland Groundwater Symposium, September 26, 2019.
- Cargill IV, J.G., 2019. WATAR – Big Idea Proposal. Presentation given at Watershed Assessment & Management Retreat, October 31, 2019.

- Cargill IV, J.G., 2109. A-Street Ditch Remediation – Wilmington Delaware. Presentation prepared for SETAC Sediment Interest Group, November 2019.

Peer Reviewed Publications: There were no peer reviewed publications from WATAR Team members in 2019; however, a draft manuscript summarizing the Mirror Lake Remediation and Restoration Project in Dover, Delaware has been accepted for publication by the Journal of Environmental Engineering. It is expected that the manuscript will be published in 2020.

National Organization Involvement: WATAR team Members played key roles in advancing watershed scale assessment and management of contaminated sediments and fish exposure nationally in 2019:

- Association of State and Territorial Solid Waste Management Officials (ASTSWMO) – WATAR team member Todd Keyser is a member of the ASTSWMO Sediments Focus Group. The focus of the team has been to foster collaboration, innovation and consistency amongst state agencies when determining regulation, policy and innovative approaches to contaminated sediment investigation, analysis and remediation. Focus Group activities were morphed into the Investigation and Remedy Selection Focus Group in 2019.
- ITRC Contaminated Sediments Remediation Team. WATAR team member John Cargill served as co-Team Leader for the group beginning in 2011. Active team activities ceased in 2018 after multiple years of web-based training events on the use of the comprehensive technical and regulatory guidance document. Archived training sessions are still being offered by USEPA through their Clu-In website.
- National Fish Exposure Workgroup. WATAR Team member John Cargill represented the State of Delaware at a Fish-Sediment Exposure Workshop that was developed and hosted by the US Army Corps of Engineers and the national Sediment Management Workgroup (SMWG) in 2018. The meeting included government, academic, industry and consulting experts for the purpose of discussing the assessment of exposure to humans via the consumption of fish impacted with sediment-related contaminants. Follow up actions from the team were initiated in 2019 and are ongoing.

Local and Regional Workgroup Involvement: WATAR team Members played participatory roles in advancing regional and local initiatives in 2019:

- DRBC Toxics Advisory Group
- DRBC Co-Regulators Committee
- Chesapeake Bay Program Toxic Contaminants Workgroup
- DENIN External Advisory Board
- DGS State Map Geologic Mapping Advisory Committee
- Delaware Environmental Monitoring Coordination Council